

ANNUAL HABITAT WORK PLAN

PARKER RIVER NATIONAL WILDIFE REFUGE

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I. INTRODUCTION

Parker River National Wildlife Refuge was established in 1942 primarily to provide feeding, resting and nesting habitat for migratory birds. The Refuge consists of 4,662 acres of diverse upland and wetland habitats including, sandy beach and dune, shrub / thicket, bog, swamp, freshwater marsh, salt marsh and associated creek, river and mudflat, and salt panne. Approximately 262 acres of fresh and brackish water impoundments were created on the Refuge in the early 1950's for migratory birds. These and other Refuge habitats support varied and abundant populations of resident and migratory wildlife species including more than 300 species of birds and additional species of mammals, reptiles, amphibians, insects and plants. The Refuge also supports nesting piping plovers, a threatened species through monitoring and protective efforts.

Parker River Refuge is currently developing a Habitat Management Plan, and expects a final HMP by fall of 2005. The Refuge finalized a master plan in 1986; however, much of the wildlife goals and objectives from that planning effort are out of date. Current habitat management programs implemented on the Refuge are continuations of historic practices (impoundment and grassland management) or have been opportunistic (salt marsh restoration and invasive plant control).

II. HABITAT MANAGEMENT

A. Salt Marsh Restoration

Salt marsh restoration using open marsh and water management (OMWM) techniques has been ongoing at Parker River National Wildlife Refuge since 1991 through a partnership with the Northeast Massachusetts Mosquito Control and Wetland Management District (NEMMCWMD). In 2000, the Refuge signed up to participate in the Region 5 OMWM Study.

Habitat Objectives

The objectives of the OMWM program are:

- Return high water table and normal flooding regimes to marshes altered or damaged by grid-ditching, resulting in improved Service trust resource habitats and increased high marsh natural biodiversity.
- Provide satisfactory long-term biological control of saltmarsh mosquitoes in order to reduce or eliminate chemical pesticide use on Service lands.

The objective of the OMWM Study is to determine how the various techniques are benefiting or impacting resources of concern (birds, vegetation, hydrology, fish, and mosquitoes).

In 2004, 27 acres of salt marsh were restored using OMWM techniques. To date, approximately 150 acres of salt marsh habitat have been restored through a partnership between the Refuge and NEMMCWMD. Influence of the OMWM techniques already completed extend beyond the actual acres restored.

In addition to the surveys associated with the OMWM study, salt marsh sparrow breeding surveys have been conducted annually since 1999. In 2004, Parker River also participated in a salt marsh sparrow mercury bioaccumulation study coordinated by Rachel Carson Refuge.

Habitat Response

Vegetation and hydrology are being monitored as part of the ongoing regional study. The last site to be restored as part of the study will be completed by winter of this year. The data is analyzed annually by USGS Patuxent Wildlife Research Center and University of Rhode Island. Response of habitat will be analyzed at the end of the study in 2006.

Response of Resources of Concern

Macroinvertebrate use, bird use, and mosquito breeding data are being monitored as part of the ongoing regional study. The last site to be restored as part of the study will be completed by winter of this year. The data is analyzed annually by USGS Patuxent Wildlife Research Center and University of Rhode Island. Response of habitat will be analyzed at the end of the study in 2006.

Preliminary results from the salt marsh sparrow mercury study showed abnormally high mercury concentrations in sharp-tailed saltmarsh sparrows captured at Parker River. Mercury concentration from ten birds at Parker River averaged 1.09 parts per million. This concentration was significantly higher than those found at the nine other site (both Refuge and non-Refuge lands) in the study. The only other comparable site was Chafee Refuge in Rhode Island, which averaged 1.08 ppm.

Proposal Year: Management Strategy Prescriptions

The last of the study sites will be restored in the winter of 2004/spring of 2005. Habitat and wildlife monitoring will continue for at least another two years. In 2005, the Refuge will be investigating the effect of OMWM practices on marsh development in relation to sea level rise using Sedimentation Erosion Tables at various study sites. We will also continue to coordinate with Rachel Carson and Rhode Island Refuges to follow up on the salt marsh sparrow mercury study. We will continue to conduct the annual salt marsh sparrow survey in 2005.

B. Grassland Management

Habitat Objectives

Manage 77 acres of grasslands to provide breeding and migratory habitat for grassland dependent species such as the Northern Bobolink, Savannah Sparrow and several species of raptors including Short-eared owls and Northern Harriers. Management of the grasslands is accomplished through annual mowing of open fields to discourage invasion of woody vegetation.

- Manage Refuge lands for a diversity of mammal and non-migratory species at optimum population levels by providing a wide range of habitats at various successional stages (Master Plan 1986).

Consistent with this goal from the 1986 Master Plan, Refuge staff has been maintaining certain areas in early successional habitats (fields and open shrublands). The fields adjacent to the impoundments were historically mowed to provide goose browse, and have continued to be mowed every year. The North Pool Field, south portion of the Bill Forward Field, Cross-Farm Drumlin, Stage Island Drumlin, and Nelson's Island are maintained as open fields. The north portion of Bill Forward Field is maintained as early successional shrub habitat. All fields were mowed by Refuge staff in August and September.

Habitat Response

In 2004, we achieved the objective of maintaining a mosaic of early successional habitat by mowing the management units described above. The north portion of the Bill Forward Field was mowed in a mosaic pattern to maintain the open shrub habitat. In the other units, milkweed, aster, and goldenrod stands were not mowed to provide feeding areas for monarch butterflies during fall migration

Response of Resources of Concern

No wildlife response is monitored. American woodcocks, white-tailed deer, and wild turkeys are observed utilizing the early successional habitats. The early successional habitat adjacent to the Bill Forward Pool provides lekking grounds for American woodcock. Deer and striped skunks are often found feeding in the open fields.

Proposal Year: Management Strategy Prescriptions

The North Pool Field will be completely mowed in late August after ground nesting birds such as Bobolinks have fledged young. A few small areas that support cranberries will not be mowed in the lower elevations to provide wildlife browse and berry picking opportunities for the visiting public.

The Bill Forward, Stage Island and Nelson Island Fields will be mowed in late August in a mosaic pattern, leaving small stands of milkweed and other wild flowers for butterfly use during fall migration. A site review by NatureServ found the mosaic field at the north end of the Bill Forward field to be a sandplain grassland community, a globally rare vegetation community. This area will be monitored in the next 3 to 5 years to determine if additional mowing should continue.

Habitat Management Documentation

Two full time maintenance staff spent approximately 16 days managing grassland in 2004. In previous years the Refuge utilized the services of a cooperative farmer to hay certain management units after young birds have fledged. That individual will no longer be available for these activities.

C. Coastal Shrub and Maritime Forest Management

No active management is conducted for the Refuge's coastal shrub and maritime forest. However, several inventories are conducted annually to monitor wildlife use. These

include the Region 5 standardized landbird breeding bird and anuran surveys. Landbird surveys were initiated in 1994, and are conducted once a year, usually in June. Due to time constraints, no landbird surveys were conducted in 2004. However, vegetation surveys were conducted for each BBS point. Anuran surveys are conducted three times a year during the spring season. Additionally, Massachusetts Audubon has been running a spring and fall migratory banding station in the shrub habitat on the Refuge since 1998.

Habitat Objective

Obtain baseline data for the various suites of wildlife species using the refuge’s shrub and forest communities.

Habitat Response

No habitat manipulation is conducted in shrub and forested habitat; therefore, no habitat response is measured.

Response of Resources of Concern

Anuran Surveys

Anuran surveys show that frog and toad species are relatively evenly distributed throughout the Refuge (Survey route follows the main Refuge road). The majority of amphibians breed in the interdunal swales found in the scrub-shrub dune habitat, which are evenly distributed through the length of the Refuge. Frequency of occurrence for the four anuran species found on the Refuge was high in 2004 compared to other years. The difference is particularly significant for spring peepers and eastern spadefoot toads. The high frequency of abundance in 2004 is likely correlated with the abnormally high precipitation.

Table 1. Frequency of occurrence for anuran species at Parker River Refuge from 1999 to 2004. No surveys were conducted in 2003.

	1999	2000	2001	2002	2004
spring peeper	0.25	0.33	0.08	0.25	0.42
wood frog	0.08	0.08	0.08	0.17	0.17
American toad	0.25	0.25	0.83	0.17	1.00
eastern spadefoot toad	0.00	0.08	0.67	0.33	0.42

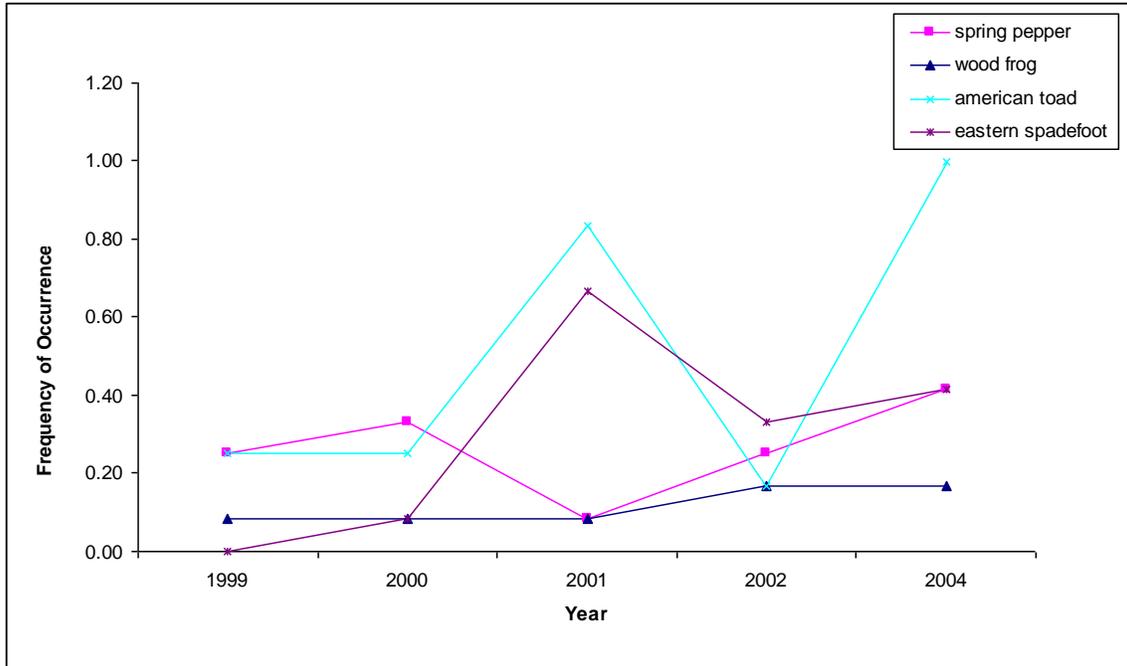


Figure 1. Frequency of occurrence for anuran species at Parker River Refuge from 1999 to 2004. No surveys were conducted in 2003.

Migratory Landbird Banding

In 2004, the banding station banded 3,024 birds (1361 birds in spring and 2,033 in fall) and 87 species (69 species in spring and 66 in fall) with a banding effort of 7,896 net hours (2,666.5 in spring and 5,229.5 in fall). The most common species captured were gray catbird, myrtle warbler and white-throated sparrow.

The banding station also gave some anecdotal evidence that the habitat at Parker River Refuge is providing important fueling habitat for migratory landbirds. A Connecticut warbler, originally banded at the station migrating south in September of 2003, was recaptured three more times in the fall of 2004. In the twelve days between the 1st recapture on September 26 to the 3rd recapture on October 8, the bird recorded a weight gain of 12.4 percent (from 16.9g to 19.0g). Even more amazingly, a northern parula caught late in the season exhibited a weight gain of 30 percent in 7 days. The northern parula was first captured and banded on October 18, 2004, a very late record for this species. The bird weighed in at 6.4 grams. On October 25, the bird was recaptured and weighed 8.3 grams. The rate of recaptures for any banding program is typically small, and recaptures during a single season for migrating birds are even rarer. However, what little data the banding station collected on recaptures indicate that the birds are staying for long periods at Parker River Refuge to build up fat reserves needed to continue its migration.

Table 2. Number and species of birds banded at the Massachusetts Audubon banding station at Parker River Refuge from 1999 to 2004.

Year	Spring			Fall			Total	
	# sp	# bird	catch per effort	#sp	# bird	catch per effort	# sp	# bird
2004	69	1361	51.00	66	2092	38.88	87	3453
2003	62	698	36 days*	45	881	39 days*	76	1579
2002	69	1473	63.8	57	1176	41.5	82	2649
2001	62	893	44.25	62	1484	59.67	76	2377
2000	59	695	44.80	52	1373	76.85	70	2068
1999	54	734	58.89	56	1162	74.3	73	1896

¹ Catch per effort is calculated as the total number of birds caught per 100 net hours.

*For 2003, catch per effort was not calculated as survey effort was recorded in days instead of net hours.

Proposal Year: Management Strategy Prescription

Continue to monitor anuran population through annual frog call surveys. Map potential breeding habitat within calling distance of each survey point. Continue partnership with Massachusetts Audubon to collect data on migratory landbirds using the Refuge. Work with Audubon to associate species use with vegetative community type.

D. Impoundment Management

Habitat Objectives

Management of Parker River National Wildlife Refuge’s three man-made impoundments (North, Bill Forward, and Stage Island) requires an adaptive and integrated approach to water level management to stress undesirable plant species, primarily *Phragmites* and purple loosestrife while simultaneously stimulating the germination of seed producing vegetation and providing mud flats for shorebird foraging. The combination of various management actions in previous years has yielded short-term results, with varying degrees of success. Past management restrictions were directly related to an inability to adequately lower and raise water levels in some of the impoundments. This limitation resulted in a static water level regime for many years which lead to the cultivation of monotypic pest plant communities within these managed wetlands.

For years the Refuge staff has been trying to manage the 3 freshwater impoundments on the refuge primarily for waterfowl. Priorities and objectives have since broadened and diversified to include a variety of wetland birds and other wetland-dependant wildlife species. It should be noted that the 3 impoundments total over 260 acres. However, due to the Refuge’s inability to effectively control pest plants (man hours and funding limitations); only a portion of each impoundment is considered “manageable”.

Objectives for impoundment management are:

- 1: to provide 10-20% of exposed mud flats for spring and/or fall migrating shorebirds
- 2: to provide 30-40% of shallow water foraging areas for fall migrating waterfowl
- 3: to provide habitat for marsh and wading birds by maintaining high water levels during the breeding season (spring early summer)
- 4: to annually treat invasive and robust vegetation in at least 50% of each impoundment using mechanical, chemical and biological control techniques.

North Pool

The refuge recently completed a four-year study to determine feasibility of restoring this impoundment back to a self-sustaining tidal marsh. The result of the study indicates a high probability of a successful restoration . In FY 2005 we will continue the NEPA process for the Habitat Management Plan and work with partners to determine the preferred restoration alternative. It should be noted that due to high precipitation levels and high water levels in the impoundment rare birds for Massachusetts were observed this year. Species included: Sora rails, Least bittern, American bittern and Common moorhen.

Bill Forward Pool

The habitat objective for the Bill Forward Pool in 2004 was 1, 2 and 4.

The Bill Forward Pool (BFP) totals about 60 acres and is separated from the North Pool by a cross dike. This impoundment provides excellent foraging areas for fall migratory shorebirds as the pool edges (mud flats) become exposed during the late summer months. The Refuge uses a high capacity water pump to lower the water level within this impoundment. In 2004 water levels were lowered beginning in mid summer to expose mud flats for fall migrating shorebirds. Due to frequent rain showers it was difficult to maintain a drawdown throughout much of the drawdown period. Water levels ranged from 5.9 on 7/22/04 to 4.6 on 8/9/04. The staff gauge is not based on sea level, but merely a marker to identify water level change. Salinity readings were recorded 2-3 times per month and ranged from 3 to 13 ppt at the water control structure and 0 to 11 ppt at the southern most end. Vegetation surveys revealed the follow most common plant species:

	Occurrence	Frequency
Lythrium salicaria	22	0.73
Phragmites australis	15	0.50
Agrostis stilifera	20	0.67
Bidens connata	11	0.37
Erechites hieracifolia	10	0.33
Scirpus americanus	9	0.30
Eleocharis parvula	7	0.23
Aster spp.	7	0.23

The upper edges of the impoundment were mowed in October to control robust perennial vegetation. A small 3-5 acre test plot composed of primarily phragmites was disked in November to observe whether this technique can enhance control of robust perennial

vegetation in the upper reaches of the impoundment. Pumping commenced and water increased from available precipitation in late fall to reflood previously exposed and shallow water area to provide forage for fall migrating waterfowl in at least 20% of the impoundment.

Response of Resources of Concern

Standard volunteer bird surveys were conducted in the impoundment but they have not yet been summarized. Biologists observed the highest species diversity of both shorebirds and waterfowl in this impoundment. Post treatment monitoring in 2005 will determine if disking reduces or exacerbates the invasive *Phragmites*.

Proposal Year: Management Strategy Prescriptions

This impoundment will be incorporated in the Regional Fall Migrating Shorebird Study being conducted on specified Refuges in Regions 3 and 5. Either the Bill Forward or the Stage Island pool will be randomly selected to undergo a treatment of a late summer drawdown or a control where water levels will be maintained high throughout the season. It has not yet been determined which impoundment will be the treatment for 2005. Specific treatment parameters can be found in the study proposal to be developed by Hal Laskowski. New water level staff gauges will be installed in all three impoundments in early 2005 and based on actual elevational data related to sea level.

Stage Island Pool

Habitat objectives in this impoundment for 2004 were 2, 3 and 4.

The Stage Island Pool (SIP) is located about 5 miles south of the NP & BFP and totals about 100 acres. This impoundment has the greatest potential for moist soil management due to its gradual sloping pool bottom elevations and lack of an elongated borrow ditch. However, the lack of a freshwater source continues to provide challenges in controlling invasive vegetation. We will use tidal water to help reflood as necessary so long as the water salinity does not exceed 20ppt. The objective for this impoundment in 2004 was to maintain high water levels in 90 % of the pool to provide habitat for marsh and water birds while simultaneously discouraging growth and expansion of *Phragmites* and loosestrife. Due to the high percentage of “unmanageable portions within the impoundment due to difficulties in flooded perimeter areas, the Refuge has determined that a portion of about 30-40% of this impoundment is truly manageable. Therefore we conducted vegetation surveys in two distinct areas, 1.) along the fixed transects which generally fall within the robust unmanaged area and 2.) within the area referred to as the moist soil area where dewatering and reflooding can be better manipulated.

Response of Resources of Concern

None

Proposal Year: Management Strategy Prescriptions

This impoundment will be incorporated in the Regional Fall Migrating Shorebird Study being conducted on specified Refuges in Regions 3 and 5. Either the Bill Forward or the Stage Island pool will be randomly selected to undergo a treatment of a late summer drawdown or a control where water levels will be maintained high throughout the season. It has not yet been determined which impoundment will be the treatment for 2005. Specific treatment parameters can be found in the study proposal to be developed by Hal Laskowski. New water level staff gauges will be installed in all three impoundments in early 2005 and based on actual elevational data related to sea level.

E. Invasive Plant Species Management

Invasive plant control has been implemented on the Refuge since the 1960's; however, efforts have mainly focused in the impoundments until recently. The Refuge recently completed a comprehensive map of all invasive plant species on Parker River Refuge. Nineteen non-native species considered to be invasive¹ were found at Parker River occupying approximately 380 acre. Habitats most infested with invasive plant's include the three Refuge impoundments, grassland habitats, and dune shrub habitats.

In 2004, we experimented with various control methods for certain invasive plants. Invasive control projects in 2004 were prioritized based on the following criteria:

- Good likelihood of eradication
- Provide educational and outreach opportunities to the public
- Threaten plants, animals, and communities of management concern.

Habitat Objectives and 2004 Prescription

Based on the above criteria, the following objectives were developed for 2004:

- Implement an experimental control program to find the best management practices for perennial pepperweed
- Initiate experimental control program to manage black locust
- Initiate control of Phragmites in interdunal swales
- Monitor continued success of purple loosestrife biological control program
- Educate the public about Asiatic bittersweet through group control efforts and outreach
- Eradicate Japanese knotweed and multi-flora rose from the Refuge and Sandy Point State Reservation by 2006.

All of the above objectives for 2004 were met except treatment of multi-flora rose. Instead, we initiated control on spotted knapweed and autumn olive, whose population on the Refuge were relatively small. Invasive plant control was also implemented in the Refuge impoundments. For details, see Impoundment Management section of this document.

¹ As identified by the New England Invasive Plant Group.

Perennial Pepperweed

Comprehensive mapping of invasive species on the Refuge found eight infestations of perennial pepperweed totaling roughly 0.64 acres, mostly concentrated in the upper salt marsh area directly south of Parking Lot 1. The perennial pepperweed control study compared two different treatments (applications of Escort at 1 oz per acre and at 2 oz per acres) to a control plot. The study consisted of a block design with four replications. Information on pepperweed, marsh elder, and other species within a meter square plot were collect pre- and post treatment. Treatment of perennial pepperweed was carried out on June 23. Pre- and post- monitoring occurred on June 21 and August 11, respectively.

Black Locust

Comprehensive mapping of invasive species on the Refuge found 37 infestations totaling 34.87 acres. Most of the locust is found near the main road. In 2004, the Refuge experimented with treating a small area (0.6 acres) across from the Salt Panne Observation Area on October 31. All locust trees within the study area were treated with a 1.5 percent solution of Garlon 4 (mixed with mineral oil). For trees less than 6 inches in diameter, the herbicide mixture was applied completed around the bark. For trees greater than 6 inches in diameter, the tree was girdled above ground, and the herbicide mixture was applied to the girdle. Three meter plots were established to monitor the vegetative response of black locust and other plant species.

Phragmites Control in Interdunal Swales

Comprehensive mapping of invasive species on the Refuge found 70 infestations of *Phragmites* totaling 38.7 acres². *Phragmites* control along the main road and in the three Refuge impoundments has been ongoing since the 1970s. The Refuge initiated control of *Phragmites* in two interdunal swales in 2004 to protect sensitive plant and animal species found in this rare habitat. To minimize negative impacts to plants and animals (breeding amphibians) in the swale, control was conducted when the swales are dry. The phragmites stems were cut using garden shears and a weed whacker. Drops of 3 percent Rodeo were applied to the cut stems. Vegetative response of *Phragmites* and other plant species are monitored using one-meter plots.

Japanese knotweed

There is no Japanese knotweed on the Refuge; however, populations of knotweed are rapidly expanding in the surrounding area. In 2004, the Refuge obtained a CCI grant to initiate a community knotweed project in the County. Due to the timing of when the grant was awarded, control work for knotweed will commence in 2005.

Other invasive plants

In 2004, the Refuge controlled several other invasive plants, including Asiatic bittersweet, spotted knapweed, and Autumn olive. Four infestations of Asiatic bittersweet were cut with clippers and the cut stems painted with 5% rodeo. Two stands of spotted knapweed (roughly 0.25 acre) were removed by hand. Ten Autumn olive trees were uprooted using a bulldozer.

² This acreage does not include the *Phragmites* in the three impoundments, which total roughly 100 acres.

Habitat Response

Habitat response to biological control of purple loosestrife has been very effective since the release of the beetles from 1996 to 2001. Loosestrife population seem slightly higher this year compare to last; however, this cannot be quantified as early monitoring of biological loosestrife control was sporadic and ended in 2000. During the 2004 survey, we did observe presence of *Galerucella* egg, larvae, and adults, indicating successful overwintering of *Galerucella* beetles. Habitat response to control of other invasive species will not be available for a few more years.

Response of Resources of Concern

In the perennial pepperweed study, post treatment monitoring in August found 100 percent mortality of perennial pepperweed treated with both Escort application of 1 oz per acre and 2 oz per acre. Monitoring in summer of 2005 will tell if Escort has multi-year effects. Follow-up monitoring in 2005 will determine effectiveness of control for black locust and *Phragmites* in interdunal swales. Similarly, follow-up site visits in 2005 will determine if control of Asiatic bittersweet, spotted knapweed, and Autumn olive has been successful.

Proposal Year: Management Strategy Prescriptions

- Continue to monitor control of the invasive species described above. For perennial pepperweed, use Escort at 1 oz per acre if follow-up treatment is necessary. For black locust, follow up with spring-treatment of any sprouts.
- Map occurrences of native pitch pine (*Pinus rigida*) and non-native red pine (*Pinus resinosa*) and black pine (*Pinus nigra*). By end of 2004, develop a plan to restore native pitch pine forests.
- If time and funding allows, expand treatment of black locust, spotted knapweed, perennial pepperweed and multiflora rose.

F. Beach (Plover and Tern) Management

Habitat Objectives

Protect 6.4 miles of piping plover habitat on the Refuge beach by restricting public access to nesting areas beginning April 1 and continuing until all plovers have fledged. Survey and record productivity 4-5 times per week. Symbolically fence and sign known nesting sites on Sandy Point State Reservation and on the Town managed beaches in Newbury and Newburyport. Survey areas 3-4 times per week.

Protect nests from predators through the use of exclosures and implement control on nuisance animals. Follow the guidelines as described in the Atlantic Coast recovery plan which targets a productivity of 1.25 young per breeding pair.

Habitat Response

6.2 miles of Refuge beach were completely closed to public access during the nesting period (April 1 through August 12, 2005). Because no plovers were observed for several weeks within the vicinity of Parking Lots 6 & 7, this area was re-opened on July 6. The area just off Lot #1 (from the foot of the stairway to the north boundary) remained open during the entire nesting period for public access because there were no nesting plovers in that vicinity. This area was symbolically fenced and signed.

Response of Resources of Concern

The total of 7 piping plover pairs were documented on the Refuge in 2005 with a total of 13 nesting attempts. Six of the 7 pairs hatched 23 chicks and fledged 13 young. The resulting productivity was 1.86 chicks per breeding pair. Of the 6 pairs which hatched eggs, 5 pairs hatched 4 eggs, and 1 pair hatched 3 eggs. Including failed nests, a total of 42 eggs were laid of which 23 hatched, a 54.8 % hatching success. All 6 pairs which hatched eggs fledged young. Two pairs fledged 3 young each, 3 pairs fledged 2 young each and 1 pair fledged 1 young. Therefore, a total of 13 chicks fledged from 23 hatchlings resulted in a 56.5% fledgling success

Proposal Year: Management Strategy Prescriptions

Refuge plans are to continue with the monitoring, and protective efforts described under the objectives section.

G. Artificial Nesting Structure Management

The Refuge maintains four nesting sites to provide nesting habitat for purple martins and three nesting platforms for osprey. Purple martin nest sites are located at the old Refuge HQ located on the north end of Plum Island, the new HQ site, the visitor contact station near lot #1, and at sub-hq. A combination of various nest structures are use including T-14's and gourds for the purple martins. Osprey platforms are located at the end of the Pines Trail road in the salt marsh, on the south side of Cross Farm hill and at Nelson Island. Volunteers have monitored the purple martin nests the last two years. Monitoring starts in the spring April / May and continues throughout the summer on a weekly / biweekly schedule. Refuge staff and volunteers monitor the osprey nests. A total of 61 purple martins fledged in 2004. Due to a cool season with much precipitation mortality rates were high. Osprey have successfully nested and fledged at the Refuge nest platforms. Data on osprey has not been quantified, only incidental sightings have been noted.

H. Baseline Inventory

Historically, management and surveys at Parker River have focused primarily on birds. As we move to an ecosystem approach for management, the Refuge has a goal of insuring biological integrity of the various natural communities of Plum Island. The following objectives involve gathering baseline data in order to make better-informed decision in the future.

Habitat Objectives

- Inventory the Refuge for the less-known taxa, such as plants, insects, and amphibians.
- Prevent loss or degradation of rare vegetative communities through routine monitoring efforts.

Habitat Response

Not applicable.

Response of Resources of Concern and Management Strategy Prescription for 2005

Various projects were initiated in 2004 to provide better baseline data for the Refuge. With funding from the regional biologist team, the Refuge was able to get a vegetative habitat map. The map is currently in draft form, and will be finalized in 2005.

The Refuge also initiated a plant inventory and associated herbarium to better document the plant species found in the Refuge's diverse habitats. The herbarium will be used as a reference for Refuge and seasonal staff to ensure accurate plant identification for various vegetation surveys. To date, over 100 species have been identified and cataloged. We will continue this effort in 2005.

Parker River hosts several rare and exemplary natural community types. Two communities identified by NatureServ and the State's Natural Heritage Program as important communities to preserve are the interdunal swales and sandplain grasslands. In 2004, the Refuge experimented with targeted control (cut stem and drop) of *Phragmites* in the interdunal swale (see Invasive Plant Control section). For next year, we will establish procedures for monitoring the sandplain grassland for shrub encroachment, and the interdunal swales for encroachment from invasive plant species.